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ABSTRACT

The ParlEuNet (European Parliament Network) under development at the Joint Research Center of the European Communities is a Web-based information system that will provide a multimedia educational platform for 10 secondary schools across Europe. Schools, teachers and pupils will use the system to teach, learn about, and prepare collaborative projects on the European Parliament. State of the art Internet technology together with a set of pedagogical models will be employed to give live access to a highly dynamic multimedia database and promote a student-centered problem based learning. Web servers, browsers, digital certification, Java/JavaScript, URN and metadata technologies will allow an easy and transparent access to a set of resources. The pilot experiment under development will have to provide a validation platform to propose useful, transferable models on learning in a telematics environment for generalization in a maximum number of European schools. The purpose of this paper is to give a general idea of the ParlEuNet system, showing its component parts, discussing its possible uses and describing the basic techniques that will be used to implement it. (Contains 15 references.) (Author/AEF)

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A telematics learning environment on the European Parliament: the ParlEuNet system

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Abstract - The ParlEuNet (European Parliament Network) under development at the JRC is a Web based information system that will provide a multimedia educational platform for 10 secondary schools across Europe. Schools, teachers and pupils will use the system to teach to, learn about and prepare collaborative projects on the European Parliament. State of the art Internet technology together with a set of pedagogical models will be employed to give live access to a highly dynamic multimedia database and promote a student-centred problem based learning. Web servers, browsers, digital certification, Java/JavaScript, URN and metadata technologies will allow an easy and transparent access to a set of resources. The pilot experiment under development will have to provide a validation platform to propose useful, transferable models on learning in a telematics environment for generalisation in a maximum number of European schools.

1. Introduction

The World Wide Web (WWW) has shown to be a really good means of distribution and communication of multimedia content worldwide. On-line databases, data catalogues, advertisement services, data dictionaries and searching tools are commonly used within information communities today. Access to data and information has been made easy and straightforward. JRC ISIS has developed several dynamic Web based information system. These systems allow users to register and to submit and update information and data to a closely integrated database. The European Wide Services Exchange (http://ewse.ceo.org) developed for the Centre for Earth Observation has been very successful and is now used regularly by Europe's community of remote sensing specialits. Other systems are the G7 Environment and Natural Resource Monitoring (http://ceo.gelos.org) and the CEOS Information Locator System (http://cils.ceo.org). This last system has servers worldwide and allows for metadata synchronisation between servers. A feature of the EWSE is that each user has personal Web space where they can customise and update documents, images etc. This type of server is characterised by a "self populating database" whose content is defined by the users of the system.

The ParlEuNet (European Parliament Network) is the first European initiative to permit secondary school students to use state of the art networks and multimedia resources to learn about and do collaborative projects on the European Parliament. Internet connections, videoconferencing and a website containing a well-structured dynamic multimedia database of educationally relevant materials will be used by students to access information on the European Parliament, create their own projects, and exchange information and views with members of Parliament and students in other countries. The students' work will gradually supplement the website with educational modules and resources which can be used by other students. The ParlEuNet system is under development at the JRC site and aims to provide a first prototype system by September 1998.

The objective of this document is to give a general idea of the ParlEuNet system showing its component parts, its possible uses and describe the basic techniques that will be used to implement it.

2. General description

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The ParlEuNet system will provide a multimedia database on the Internert to be accessed by 10 schools across Europe. The theme of the database will be the history, institutions and functions of the European Parliament. The system will handle two types of information : reference material and dynamic educational material. The former concerns information and description of the European Parliament, the European Union and the Institutions of the EU; this will provide the basic set of data chunks which students and teachers can access and derive information. The dynamic education material contains the structured work defined by teachers (course work, assignments) and by pupils (projects, documents).

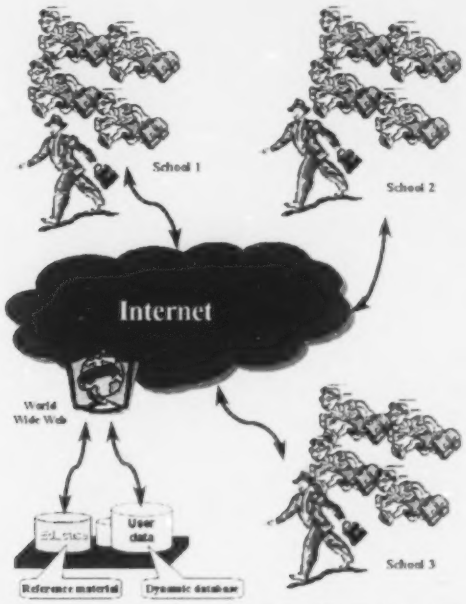

Figure 1 - Overview of the ParlEuNet system

The EDUCASE software under development by Arboth Learning Technologies NV will be used to store and retrieve all the reference material. Whereas the full dynamic educational content will be handled through a Web multimedia database. The EDUCASE software is currently a PC based system supporting teachers and learners. It consists of two tools. The first allows educators to enter course material into an MS-ACCESS database and to define structured course material using an editing tool. The second, Edubrowser allows learners to access the course material in an interactive fashion. The student can select different views of the material - through scenarios and through linked structures. The material is formatted in HTML and is supported by helpers such AVI video players. The system runs on a standalone PC and all the software tools are written in Visual Basic. EDUCASE was developed under a previous EU funded project and is now being applied for technical education and training by several industries and companies. The EDUCASE software will be interfaced to the ParlEuNet system either using the ODBC protocol and/or a Web server accessable by users thorugh a Web browser.

The ParlEuNet system software will be tailored for the needs of students and teachers to exploit the new technology available to them through the Internet. The system will allow individual students to prepare and submit material visible by the teacher and/or other students. Groups of students will be able to prepare joint project work. Communications between schools, between students and remote collaboration on project work for students from different schools will be possbile using the system. ParlEuNet aims to provide a transparent and integrated interface to the overall material. Students will be directed towards EDUCASE for reference material about the Parliament and to the dynamic system for authoring and structuring project material. At the same time, users can access the Internet at large for acquiring additional data and material and insert into their work.

A tree view of available resources will be displayed into the entry page of each user, giving a easy to understand and straightforward way to navigate through databases. Any object within the EDUCASE system can be incorporated into student created material held within the dynamic database.

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There will be a unique identification system to retrieve resources stored within the system. Both systems must support three languages : English, French and German. Users will have the freedom to feed data and search keywords in different languages. Each user of the system will be identified uniquely, giving them a persistent profile for long term and transient (session) information. Each user will have their own private area where they can upload and store data. Students and teachers will be able to interact with databases and construct and structure their work as HTML pages. A simple content editor will be developed to help users to fulfill this task. A hierachical structure of all data will be assured to give the possibility to school directors, teachers and the database manager to administer objects of a specific subpart of the system. Teachers will be able to delete or modify as well as insert resources into pupils private space. Each school and class will have their Web page where identity cards and information of all members are collected together automatically. The system will allow to build collaborative project pages between schools, between members of a particular school or pupils of a specific class. There will be a teacher or student that will own a project or assignment. An internal message system will be set up to allow student-to-student iteraction. It will be possible to set up a group work Web space to which a number of users can contribute. A bulletin board facility will be available to students to post a message or a question and get back an answer by somebody else. A logging system will be built into the server to allow educationalists to analyse the reaction of students to the system. The logging will register the accesses to items and the choices and constructs made by the students.

Downloading of large multimedia files over the Internet can be a serious problem. Therefore a caching system will be set up. There will be a CD-ROM issued regularly containg update from the database of video clips, sound files, VRML models etc. The system will automatically identify which data to load from the client CD-ROM and which other to load over the Internet. There must be an educationalist interface to allow researchers to analyse the activities of the students giving a full access to all parts of the database.

Possible scenarios

Based on the description given above a set of sample use cases of the system will be described here.

Populating the reference database

This scenario concerns the definition and insertion of the reference material of the European Parliament within the EDUCASE system.

1. The reference database is populated using the existing editing and data entry tools provided with the software.
2. A researcher identifies a number of documents, images, video clips and speeches, which cover the historical development of the Parliament.
3. All the inserted material is classified into course material, case studies and a set of learning goals/path is defined.
4. All the documents are digitised and converted to HTML and the images are converted to JPEG.

Populating the dynamic database

This scenario describes how a user can register into the system, insert data, create projects and set assignments.

1. The user accesses the Web server and get registered in. Each user receives a unique digital signature (like a credit CARD ID) that will be used to identify them in future.
2. Each registered user has a personal Web space and a personal profile where they can submit reports, research and personal details.
3. Students are grouped into classes. Classes are grouped into teacher groups. Teachers are grouped into schools. Schools are grouped into divisions etc. Each group of users has a Web page including all members' ID cards.
4. A teacher submits assignments for members of the class. Each pupil create a set of documents (or projects) for that assignment.

Student assignment work

This scenario describes a simple use of the system to define a collection of resources and publish it.

1. A teacher or a user organise the assignment work and/or the project work.
2. Students research for information in the reference EDUCASE database or directly on the Internet. They include and collate their contribution (results) into a report document.

3. Students use a dedicated HTML content editor to structure, format and organize their resources. They publish the document to the dynamic database.
4. Teachers receive a notification after each student contribution.
5. All the project or assignment work is structured into a document collection.

Inter School work

This use case describes a path of interaction and collaboration between users.

1. A head teacher or educationalist set up a user group composed by members of a different classes, different schools and perhaps different districts
2. The head user set up the access rights to the group project page.
3. Each member contributes to the project submitting their own contents.

Educationalist research

This scenarios outline how a researcher can analyse and monitor the progress and effectiveness of the system.

1. The logging system will contain information about chioce material and decisions made by students.
2. A educationalist has read access to all elements of the database and can view any assignment and report submitted across all users.
3. The educationalist calls up an analysis tool to produce a report of activity within a certain project or for acertain student.

Registering new schools

The last use case describe a possible way to expand the ParlEuNet system to other schools.

1. The ParlEuNet will be publicly visible, but no write or access will be possible to individual class work of students. Only school and class Web pages will be visible.
2. A new school may apply to be registered on the system. When agreed by the administrators, they can be included in the network.
3. The new school Web space will be automatically created when they register in the first time.

3. Technical description

The following section will depict the system architecture as is under development at the JRC.
The ParlEuNet system will be built using a four tier layered architecture. A modern *Web browser* on the client side, a *Web server* on the server side backed by the *applications/tools* and the underlaying data holding. There will be a level of indirection into the data holding splitting up the database into two parts : the *entity object model* and the *flat data storage* (see Figure 2).

The entity object model contains the links, references and metadata which constitute the virtual worlds which make up the users environments. Whereas the flat data storage contains the physical images, sound and video clips, the reference material (EDUCASE) and text files. The neat separation between logical and physical resources will allow to mirror part of the system on CD-ROM or onto a Web site close to the target schools (Intranet).

The actual model of the World Wide Web does not address issues like user identification, session management, persistence and data description. The ParlEuNet system will try to solve those problems using an enhanced Web server integrating modules to handle user identification, session tracking, user profile persistence and metadata handling. This implies that a complete personalized and persistent environment will be automatically available prior to invoking the ParlEuNet application components.

To identify uniquely a user on the system a digital certificate and/or a basic authentication will be used. This solution will be almost invisible to the user. A separate session module, built into the Web server will manage and track individual user sessions (i.e. a user having multiple sessions opened, or logged in on more than one machine). Using the identity, the authorisation and session information a private profile database, session database and Web accessible directory will be made available to the application being invoked.

The general architecture shown in Figure 2 emphasizes how the system has been defined according to application specificity. A rigorous distinction between User Interface (UI) components and applications, entity object model and flat data storage has been made. The reason for the first distinction is to make functional decomposition easier and

allow a fast prototyping of the user interaction. This functional separation will allow to deploy and store part of the server applications near the user Web browser and tighten the bandwidth requirements.

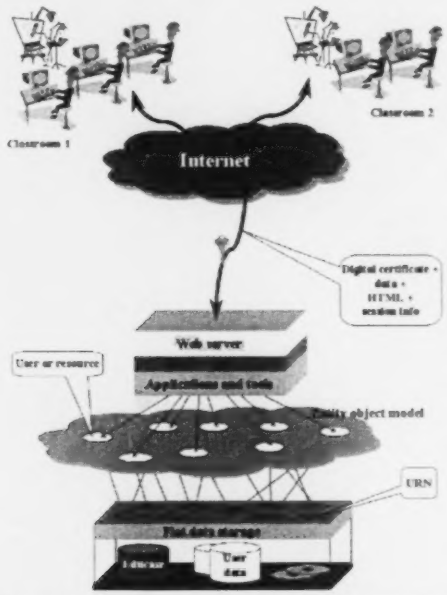

Figure 2 - The ParlEuNet system architecture

The distinction between the entity object model and the flat data storage is twofold. First, it allows references to the EDUCASE database directly from projects and assignments. Secondly, through a set of CD-ROM backups will be possible to move part of the physical entities on the client side (in particular those elements which are too cumbersome to transfer or which are often used). In this way, users will be still able to modify elements referred to on the CD-ROM, but such a modification would imply that the data will be loaded from the remote data storage again until the next backup is burned and dispatched. Using the Uniform Resource Names (URN) technology will be possible to federate and independently manage these entities. A URN consists of a persistent URL with an extra level of indirection behind it. Federated URNs will allow for an arbitrary number of depositories with little or no interconnections or shared management. The URN resolution to a URL will be done automatically when necessary.

The entity object model contains effectively a object relation model of various resources owned by pupils, teachers and managers, such documents, projects and assignments. To communicate such information structure between client and server applications a metadata strategy is needed. This should allow to serialize the data model and pass it fore and back between the Web server and the Web browser. At the JRC, it is under investigation the use of the new Web metadata technologies like the Extensible Markup Language (XML) and the Resource Description Framework (RDF) to fulfill this crucial task.

4. System prototyping

A series of prototypes of the ParlEuNet system are under development at the JRC. These aim to provide a basic framework on which the final system will be built.

The actual prototypes are implemented using Apache (version 1.2 or higher) as Web server running on a FreeBSD UNIX machine, PERL5 as programming language on the server side and HTML/Java/Javascript to provide the UI on the client side. The system has been tested using Netscape 3.0 and/or Netscape Communicator 4.0 as well as MS-IE 3.0-4.0. The Apache software has been customized to include a session module, a digital certification module and many others.

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The prototype under development is available at the following address : https://pen.jrc.it

5. What to espect from the ParlEuNet

A first prototype version of the system must be ready by January 1999. Based on the first prototype the final system will be defined and implemented.

A variety of collaborative activities will be planned in the experimentation phase. ParlEuNet will experiment with pedagogical models that promote student-centred problem based learning aiming at the design of guidelines for working in telematics learning environments. Training workshops will be conducted to integrate the telematics learning environment into classroom practice, get feedback on content, the appropriateness of the media involved. Following the experimentation, the results will be analysed. In addition to educational publications, a practical guide will be produced to disseminate the results to other European schools to generalise the results from the pilot experiment. A hands-on workshop in the European Parliament will be organised for policymakers and Parliamentarians. Workshops will be organised on a national level by parents' associations as well as the distribution of a project video and major on-line hyperlinking with European educational projects.

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